Physico-chemical Composition of *Grewia coriacea* Mast. (Malvaceae) Fruit during ripening

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Abstract

The physico-chemical juice change composition of *Grewia coriacea* Mast. fruits during development and ripening were determined. The results of proximate analysis have showed that, the percent in water content and titratable acidity decreased with ripening. Tartaric acid level is high more than malic acid whatever the stage of development and ripening. The physical and minerals elements composition increase with development and ripening.

Keywords: Physico-chemical, composition, fruit, ripening.

Introduction

Congolese forests are rich in plant species. Some of them are used in traditional medicine, as food resources¹. These forests are still incompletely studied, and are become now subject to uncontrolled exploitation, which may in the long term lead to the extinction of many plant species. Among food resources, there are fruits whose play an important role in human nutrition, especially as sources of vitamins and mineral elements². Despite their importance, studies devoted to them are limited only on general information about their consumption, morphology, dispersion mode. Knowledge about the mode and conditions of development are lacking as pointed in some studies³⁴.

The chemical composition of such comestibles like *Dacryodes edulis, Garcinia kola Heckel* have been studied⁵⁶⁷. Nutritional value and physico-chemical composition of apple, pear, grape and cherry are well known. However, those of *G. coriacea* Mast. (Malvaceae) called "ntsui-Teke" abundantly sold and consumed in the large portion of Congolese populations still unknown. Others studies have demonstrated the evolution of photosynthetic pigments⁸, the presence of ascorbic acid, sugar and proteins¹ in *G. coriacea*. It was also reported in the kernel the presence of arachidic, stearic and palmitic acids⁹.

The aims of this study are to determine some physico-chemical parameters of the fruit during ripening, in order to meet the socio-economic requirements of nutritional quality and sensory consumer.

Material and Methods

Plant material: The Fruits of *G. coriacea* was collected manually in Mpoumako forest (south of Congo-Brazzaville), at different stages as shown in figure-1.

Physical characteristics: The parameters pH (Hydrogen ion concentration), EC (electrical conductivity) and TDS (total dissolved solids) were measured using portable multi parameters Consort C 933.

Figure-1

Ripening stages of *Grewia coriacea* Mast. Fruits
The results revealed that the water content of the fruit examined (Figure-3) decreased with ripening: 93.40 ± 0.31%, 66.87 ± 1.99% and 60.20 ± 4.89% at unripe, veraison and ripe stages, respectively. This is explained by the synthesis of organic compounds. The water content of juice of G. coriacea (60.20 ± 4.89 %) at ripeness (Figure-2) is in agreement with other study related to apple Cayor at ripe stage. The acidity of the fruit is an important contributor to its flavor. In G. coriacea fruit examined (Figure-3), total titratable acidity was maximum in the juice of unripe fruit (69.97± 3.92 m.eq. H2SO4 L−1) then decreased as the fruit reached the veraison (58.99 ± 4.58 m.eq. H2SO4 L−1) and continued to decrease at ripeness (49.10 ± 7.55 m.eq. H2SO4 L−1). Tartaric and malic acids (Figure 4) were found to be the major organic acids and they have been shown to decrease during ripening: 107.10±5.99 to 75.15±7.01 m.eq.H2SO4 L−1 and 95.67±5.35 to 67.13±2.32 m.eq.H2SO4 L−1, respectively. Whatever in the stage of ripeness, tartaric acid was found to be in the greatest content compared to malic acid. These results show that the two acids determine the total titratable acidity. Decrease of the total titratable acidity during ripening of the fruit is attributed to an increased synthesis of soluble sugars. The result is similar to those obtained with grape juice.

Juice pH depend on acid content. The mean value of pH was 2.25 ± 0.04 in the juice of unripe fruits of G. coriacea, and then rises gradually from 2.51 ± 0.06 to 2.74 ± 0.01, respectively at veraison and ripeness. These results are similar to those obtained with Punica granatum L. which shown that ripe fruit has low titrable acidity and high pH compared to immature fruit. The results are also in agreement with those obtained in the juice of the fruit of Garcinia kola Heckel.

In Table-1, the result revealed that conductivity and total dissolved solids (TDS) increase during ripening. The mean values of TDS at unripe, veraison and ripeness stages were 874 ± 9.73, 958 ± 6.94 and 1380 ± 5.12 mg/ml, respectively. The mean values of conductivity were 1638 ± 8.10, 1858 ± 4.00 and 2578 ± 5.28 µS/cm during development and ripening, respectively. The ash values increases gradually during ripening with the maximum at ripe stage of fruit (5.85 ± 0.01 %), which confirm the richness of mineral salts in the juice of G. coriacea.

The mineral analysis (Table-1) shows the presence of magnesium, potassium, calcium, sodium and iron. Potassium, magnesium, calcium and sodium mean values contents were respectively 1740 ± 0.05, 340 ± 2.00, 230 ± 2.00 and 10 ± 0.01 mg/100g of matter, respectively. Potassium was found to be the most important mineral in the juice followed by magnesium, calcium, sodium and iron. However the sodium content remains constant throughout ripening.

The content of mineral elements is higher than those reported about Garcinia kola fruit. Iron content increased during ripening of G. coriacea fruit with a maximum in the ripeness stage: 2.40 ± 0.01 mg/100 g. This value is lower than those reported for Garcinia kola and Gardena aqualla. During fruit development and ripening of G. coriacea, the gradual increase in nitrogen gives information for the value of protein content (9.18 ± 0.02 %) of the fruits of G. coriacea. At ripeness, the proteins content are higher.

**Conclusion**

The results of this study showed that G. coriacea is an acidic fruit. The decreasing in tartric and malic acids content is responsible for the loss of acidity and total titratable acidity. At any ripening stage (unripe, veraison or ripe) of G.coriacea fruit, the increasing of pH was observed. The data also revealed that G. coriacea fruit is an excellent source of nutritional supplement in diet for humans.
Table-1

Physico-chemical parameters of *Grewia coriacea* Mast. during ripening

<table>
<thead>
<tr>
<th>S</th>
<th>pH</th>
<th>Con. (µS/cm)</th>
<th>TDS (mg/ml)</th>
<th>Ash (%)</th>
<th>Mg (mg/100 g)</th>
<th>K (mg/100 g)</th>
<th>Na (mg/100 g)</th>
<th>Ca (mg/100 g)</th>
<th>Fe (%)</th>
<th>Proteins (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>2.25±0.04</td>
<td>1658±8.10</td>
<td>874±9.73</td>
<td>3.84±0.01</td>
<td>160±1.00</td>
<td>124±2.00</td>
<td>10±0.01</td>
<td>120±2.00</td>
<td>2.00±0.01</td>
<td>6.69±0.01</td>
</tr>
<tr>
<td>V</td>
<td>2.51±0.06</td>
<td>1829±4.00</td>
<td>958±6.94</td>
<td>4.77±0.02</td>
<td>210±2.00</td>
<td>138±2.00</td>
<td>10±0.01</td>
<td>130±1.00</td>
<td>2.20±0.01</td>
<td>7.25±0.01</td>
</tr>
<tr>
<td>M</td>
<td>2.74±0.01</td>
<td>2578±15.28</td>
<td>1380±35.12</td>
<td>5.85±0.01</td>
<td>340±2.00</td>
<td>170±1.00</td>
<td>10±0.01</td>
<td>230±2.00</td>
<td>2.40±0.01</td>
<td>9.18±0.01</td>
</tr>
</tbody>
</table>

S: stage; I: Immature; M: Maturity; Con.: Conductivity.

Figure-2

Water content of *G. coriacea* Mast. juice during ripening (U: unripe, V: veraison, R: ripeness)

Figure-2

Water content of *G. coriacea* Mast. juice during ripening (U: unripe, V: veraison, R: ripeness)
Total titratable acidity of *G. coriacea* juice during ripening (U: unripe, V: veraison, R: ripeness)

Tartric and malic acids contents of *G. coriacea* juice during ripening (U: unripe, V: veraison, R: ripeness)

### References


